At What Cost?

A descriptive study evaluating cost awareness of laboratory investigations among doctors working in district hospitals in the West Coast and Cape Winelands districts.

MMED Family Medicine Research Assignment

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Declaration:

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree. I also declare that ethics approval for the study was obtained from the Health Research Ethics Committee of Stellenbosch University (Reference number: S17/08/15).

Signature: ...……..... Date: ...…….....

Abstract:

Background:

Globally the cost of health care is steadily increasing, and in South Africa it is no different. The budget for health care in the 2018 / 2019 financial year is R205 billion and is expected to increase by 7.8%. International research has found cost awareness amongst doctors to be poor and there is limited research in the South Africa. Improving cost awareness amongst clinicians has shown to have a cost saving effect.

Aim:

To evaluate cost awareness of laboratory investigations among doctors working in district hospitals in the West Coast and Cape Winelands Districts.

Setting:

Nine district hospitals within the West Coast and Cape Winelands Districts.

Methods:

A descriptive cross-sectional study in the form of a questionnaire was used. This questionnaire was adapted from previous international research.

Results:

A response rate of ninety percent was obtained. Doctors accurately estimated cost in 23.53% (95% CI 21.09 – 25.97) of thirty commonly requested investigations. Age, gender, years of experience, position held, and district of practice had no significant impact on cost awareness.

On a scale of ten, doctors rated their cost awareness as 5.48, previous training 3.00, access to information on cost as 4.88, cost influencing their decision making as 6.73 and increasing cost awareness would change their ordering as 7.58.

Conclusion:

Cost awareness was found to be poor amongst doctors working in the West Coast and Cape Winelands and was uninfluenced by their demographic factors. Doctors acknowledged this, however, and reported that they had received minimal cost awareness training and that they had limited access to information about cost.

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1 Introduction

Globally the cost of health care is steadily increasing, and various factors are driving this trend.(1–4) South Africa is no different.(2–8) With continued population growth, the quadruple burden of disease and increasing medico-legal expenses, there is an ever increasing drain on health care funding.(3,4,6)

South Africa spends approximately 8.3% of its gross domestic product (GDP) on health care.(3) This is subdivided between the public and private health care sectors.(3) The public health care sector which provides health care for approximately 84% of the population (42 million people) utilises 4.2% of the GDP.(3) Whereas the private health care sector which provides for 16% of the population (8.2 million people), utilises 4.1% of the GDP.(3) This disproportionate distribution of resources illustrates the inequality of funding within the South African health care sector.(3)

The national treasury for the 2018 / 2019 period quoted R205 billion as the allocated budget for health care.(8) This is expected to increase by 7.8% in the next financial year.(8) District health services have been allocated R90 billion, which is a significant portion of the budget.(8) This portion is supposed to provide a comprehensive primary health care (PHC) service to the majority of South Africans.(3,4) A sustainable health care service has to be cost effective, evidence based and efficient.(2–4)

Health care in South Africa is in the process of undergoing a transformation via a National Health Insurance (NHI) policy.(3,4) This policy aims to provide universal health care.(3,4) The National Health Laboratory Service (NHLS) provides laboratory services to all government facilities and will continue to provide this service under the NHI.(3–5) The annual revenue of the NHLS from the government in the period of 2017 / 2018 was R6.9 billion and is projected to grow to R7.8 billion in the 2018 / 2019 financial year.(9) The Western Cape, which serves 11.3% of the population of South Africa, accounted for 10.5 % of this total figure which amounts to R 729 million.(7,10) The NHLS is still owed R5.4 billion by the provinces and this is of great concern. (7)

The NHLS acknowledges that a substantial number of avoidable investigations are requested and have advised the implementation of an electronic gate keeping service.(5,7) Electronic Gate Keeping (eGK) is a set of rules against which investigations that are requests are evaluated and accepted or rejected.(7)

Recent research at Tygerberg Hospital, a tertiary hospital in the Western Cape Province illustrated the effectiveness of eGK.(11) Cost saving and its effect on clinical outcomes was evaluated.(11) In 80% of the cases studied, patient care was unaffected when test were rejected by electronic gate keeping.(11)

The NHLS will be placed under increased pressure by the NHI to provide laboratory services.(12) The National Health Service (NHS) in the United Kingdom could provide insight into the implementation of the NHI in South Africa.(12) Although the NHS has extensive and evidence based guidelines, their

pathology service was found to have inefficient expenditure of approximately 20%.(12) If this figure is applied to the NHLS revenue in South Africa, inefficient expenditure would amount to R1.38 billion.(12)

The inappropriate use of resources has far reaching implications, possibly compromising the ability of the NHI to provide care.(2–7,12) Under the NHI, a capitation model will be implemented.(3,4) A national pooled fund of contributions will provide finance for all services rendered.(3,4) If the NHI is unable to provide a health care service because of a lack of financial means, it could open itself to ethical dilemmas and significant litigation. This would further increase the overall expense of the NHI. In a resource limited setting, resources must be allocated based on their potential to achieve the most benefit.(2–4,6) Health care providers have to become more cost effective and adjust how they practice medicine to facilitate a sustainable universal health service for all under the NHI.

The current district health service is primarily run by junior doctors.(3) This lends itself to at times inappropriate and unnecessary investigation of patients.(5,11,13,14) Presently, the introduction of Family Physicians in the district health care service is aimed at addressing this by providing supervision, building capacity and establishing good clinical governance.(15) This is in line with the NHI plan to re-engineer PHC.(4)

Very little data about cost awareness amongst doctors in South Africa was found.(16,17) Without understanding the baseline cost awareness, the need for further training and education cannot be identified.(16) This is important as interventions that increasing cost awareness amongst doctors have shown reductions in the overall cost of patient management.(13,18)

A systematic review conducted to evaluate doctors' awareness of diagnostic and non-drug therapeutic costs found that only a third of doctors could estimate cost within 20 -25% of the actual cost.(19) Interestingly, no correlation between increased cost awareness and country of practice, year of study or specialty could be made.(19) The authors concluded that cost awareness was poor amongst doctors.(19)

Further research into what influences the utilisation of laboratory services is a strategic area to target, as it is under the direct control of doctors. Small adjustments have the potential to reduce inappropriate expenditure, free up resources to be allocated elsewhere and ultimately facilitate improved health care.

During the course of this study the first research evaluating cost awareness among doctors and nursing staff in South Africa was published.(17) This single centre study was conducted at Chris Hani Baragwanath Academic Hospital, a tertiary hospital, in the Gauteng province.(17) It looked at cost awareness of medication, fluids, disposables and laboratory investigations.(17) The cost awareness of three commonly used blood tests was evaluated which provided limited insight into the overall cost awareness of laboratory investigations. The cost awareness of doctors and nursing staff was found to be poor and this was in line with internationally reported research.(17,19–21)

Cost effective health care is multi-faceted. The modification of doctors' laboratory ordering patterns is a complex problem as patients are unique with various co-morbidities and the possibility of negatively influencing their outcomes have to be considered.(11,16,19)

Patient age greater than 65 years, hospitalisation beyond 7 days and unfavourable outcome (death or inability to make a diagnosis) are all factors that have been shown to promote the overuse of avoidable laboratory investigations.(13) Senior health care practitioners were found to order more tests, however the proportion of avoidable tests were lower than that of junior colleagues.(13)

Education on the cost of investigations, restricting and rationing of investigations, redesigning request forms, financial incentives, algorithm-based decision systems, peer reviewed protocols and guidelines and ongoing feedback to doctors are all proposed interventions to reduce the number of avoidable investigations that are requested .(13)

Increasing cost awareness versus the overall cost of managing patients has been evaluated by in a tertiary centre in the Gauteng.(18) By increasing cost awareness a significant reduction in cost was demonstrated, however, cost savings versus patient outcomes was not evaluated .(18)

This research aimed to evaluate the cost awareness of laboratory investigations amongst doctors working in district hospitals in the West Coast and Cape Winelands Districts. These hospitals are a mix of peri urban and rural facilities where there is limited onsite specialist supervision. As the NHI will depend on the functioning of such facilities this research will provide valuable information for the need for education, training as well as potential cost saving strategies.

2 Methods

2.1 Study Design

A descriptive cross-sectional study design, making use of a questionnaire, was used.

2.2 Setting

This study was set in the Western Cape Province of South Africa.

It was conducted in district hospitals within the West Coast and Cape Winelands Districts.

The West Coast District is made up of the Matzikama, Cederberg, Bergrivier, Saldanha Bay and Swartland sub districts.(10) The total population in 2017 was estimated at 457 527 and the total uninsured population dependant on government health care was 273 212.(10)

Permission was granted to conduct this study at all seven district hospitals within the West Coast District:

1. Citrusdal Hospital
2. Clanwilliam Hospital
3. Lapa Munnik Hospital
4. Radie Kotze Hospital
5. Swartland Hospital
6. Vredenburg Hospital
7. Vredendal Hospital

The Cape Winelands District is made up of the Witzenberg, Drakenstein, Brede Valley, Langeberg and Stellenbosch sub districts.(10) The total population in 2017 was estimated at 844 150 and the total uninsured population dependant on government health care was 617 870.(10)

Permission was granted to conduct this study at two of the four district hospitals within the Cape Winelands District:

1. Ceres Hospital
2. Stellenbosch Hospital

Access to Robertson and Montagu Hospital was withheld by the Cape Winelands District. The reason for this was not provided.

2.3 Study Respondents

Doctors working at district hospitals in the West Coast and Cape Winelands Districts.

2.3.1 Inclusion Criteria

Qualified doctors with an MBChB degree or HPCSA recognised equivalent. Doctors had to be employed for clinical services by the Western Cape Department of Health at the district hospital under investigation on a full-time basis.

2.3.2 Exclusion Criteria

Locum or visiting doctors not employed at the district hospital under investigation.

2.4 Eligible Respondents

A total of fifty-eight eligible respondents were invited to participate in this study. Thirty-six within the West Coast and twenty-two within the Cape Winelands districts.

2.5 Questionnaire

The questionnaire used in this study was adapted and validated from a previously validated questionnaire. The validated questionnaire had been piloted and used in other large-scale cost awareness research.(21) The questionnaire was made up of three sections namely: demographic data, cost awareness perceptions and estimation of costs.

2.5.1 Demographic Data

Demographic data included age, gender, position held, district of practice and years of practice.

2.5.2 Cost Awareness Perceptions

Doctors were asked to rate themselves, on a scale of one to ten, whether they disagreed or agreed with five cost awareness statements.

The statements were:

1) I have good cost awareness of laboratory investigations.

2) I have received training on cost awareness of laboratory investigations.

3) I have access to information about the cost of laboratory investigations.

4) Cost influences my decisions when ordering laboratory investigations.

5) Better cost awareness would change my ordering of laboratory investigations.

2.5.3 Estimation of Costs

Doctors were asked to estimate the price to the closest whole rand for thirty commonly ordered laboratory investigations.

2.6 Data Collection

Data was collected via a questionnaire created on the Google forms platform over a three-month period. Informed consent was obtained from all respondents. The questionnaire required respondents to complete all fields prior to submission, eliminating the potential for missing data or incomplete forms. The questionnaire was administered by the principle investigator at a scheduled time arranged with the medical or clinical manager of each facility. Each respondent was provided with a concealed envelope containing a unique random identifier allocated to their respective hospital. Concealed envelopes were prepared for the investigator to prevent identification of any hospital to respondent.

Respondents were sent a link to the questionnaire which they completed on their own electronic cellular device without assistance from fellow colleagues or any other resources. To ensure that respondents did not incur any cost while completing the questionnaire a 3G Wi-Fi access point was established during data collection. Paper based copies of the questionnaire were available if any technical issues arose.

Medical or clinical manager at each of the district hospitals were asked to withhold the content of the study from the respondents. This aimed to reduce bias and the potential forewarning of respondents.

2.7 Data Analysis

Data was reviewed, cleaned and coded in a spread sheet prior to data analysis. Confidentiality was ensured via the use of the unique identifiers, which prevented identification of any one respondent or facility during data analysis. Data was analysed with assistance from the Centre of Evidence-based Health Care at the Stellenbosch University.

The demographic data was analysed to determine the baseline characteristics of the respondents and to determine if any associations to cost awareness was present. The cost perceptions data was analysed to provide insight into the respondents' attitudes towards cost awareness by determining their mean response and 95% confidence interval.

Previous studies established that cost estimations within 25% of the absolute cost can be regarded as accurate.(19) The accuracy of cost estimations in this study were based on this percentage.

The accuracy of cost estimates was determined by calculating the absolute difference of the respondents' cost estimates from the actual prices. The accuracy of estimations for all thirty investigations was determined per respondent. These were then totalled to determine a respondent's overall accuracy of cost estimation. The overall accuracy of cost estimates per investigation was also calculated. This was done to determine if estimations for any one investigation was significantly more inaccurate than the others. A t-test was used to determine associations between gender and district of practice with accuracy of cost estimates. A one-way analysis of variance (ANOVA) was used to determine association between position held and years of practice with accuracy of cost estimates. Regression analysis was used to determine if demographic factors or cost perceptions had any association with accuracy of cost estimates.

3 Ethical Considerations

Ethics approval was obtained via the Stellenbosch University's Health Research Ethics Committee 2. Ethics Reference number: S17/08/15.

4 Results

4.1 Respondents

A ninety percent response rate was obtained. A total of 52 of the potential 58 respondents completed the questionnaire (See Table 1). It was calculated that a response rate of fifty-one was needed to obtain a 95% confidence interval with a 5% margin of error.

All questionnaires were complete with no missing data.

The reasons for non-response were: maternity leave (two), sick leave (two), annual leave (one) and a leave of absence (one). Concealed envelopes were left with the medical manager at each facility for all non-respondents to complete on their return. Reminders were sent to all medical and clinical managers via email, however, none of the non-respondents responded during the three-month data collection period. As all responses were anonymous and confidential, non-respondent could not be contacted individually to remind them to respond or determine their reason for ongoing non-response.

Table 1: Distribution of Respondents vs. Non-respondents

District	Respondents	Non-respondents	Eligible Respondents
West Coast	32	4	36
Cape Winelands	20	2	22
Total	52	6	58

4.2 Demographics

Table 2: Demographics of Respondents

		Mean	Range
Age		32	25-61
		Number:	**Percentage:**
Gender	**Male**	22	42.31%
	Female	30	57.69%
Position Held	**Community Service Doctor**	20	38.46%
	Medical officer	25	48.08%
	Registrar	4	7.69%
	Specialist	3	5.77%
District of practice	**Cape Winelands District**	20	38.46%
	West Coast District	32	61.54%
Years of practice	**1-5**	29	55.77%
	6-10	13	25.00%
	10+	10	19.23%

4.3 Cost Awareness Perceptions

On a scale of one to ten, respondents rated their perceived cost awareness as 5.48, training received as 3.00, access to information about costs as 4.88, that cost influenced their decision making when ordering laboratory investigations as 6.73 and that increasing cost awareness would change how they ordered laboratory investigations as 7.58.

Table 3: Cost Awareness Perceptions with Mean Rating (Likert Scale 1-10) and 95% CI

Statement	Mean Rating	95% CI
1) I have good cost awareness of laboratory investigations.	5.48	(4.80 - 6.15)
2) I have received training on cost awareness of laboratory investigations.	3.00	(2.38 - 3.62)
3) I have access to information about the cost of laboratory investigations.	4.88	(4.07 - 5.68)
4) Cost influences my decisions when ordering laboratory investigations.	6.73	(6.14 - 7.31)
5) Increased cost awareness would change my ordering of laboratory investigations.	7.58	(7.04 - 8.11)

4.4 Cost Estimates

An accurate estimation of cost occurred in only 23.53% (95% CI 21.09 – 25.97) of thirty commonly requested laboratory investigations.

The tendency was to overestimate (42.05% (95% CI 34.7% to 49.4%)) rather than underestimate (34.42% (95% CI 27.6% to 41.3%)) cost. However, this was not statistically significant (P = 0.13123) (See Graph 1: Distribution of Cost Estimates per Investigation). The investigation that was most commonly underestimated was the GeneXpert (GXP) and the investigation that was most often overestimated was the Ziel Nielson smear (ZN).

Investigations with a lower cost (below the mean cost of all the investigations) were overestimated and investigations with a higher cost (above the mean cost of all the investigations) were underestimated.

No associations between gender- (t-test, P = 0.2668), position held- (ANOVA, P = 0.3469), district of practice- (t –test, P = 0.7662), years of practice- (ANOVA, P = 0.85737) and the accuracy of actual cost estimates were found.

Local polynomial regression showed no association between demographic factors and cost perceptions with accuracy of cost estimates.

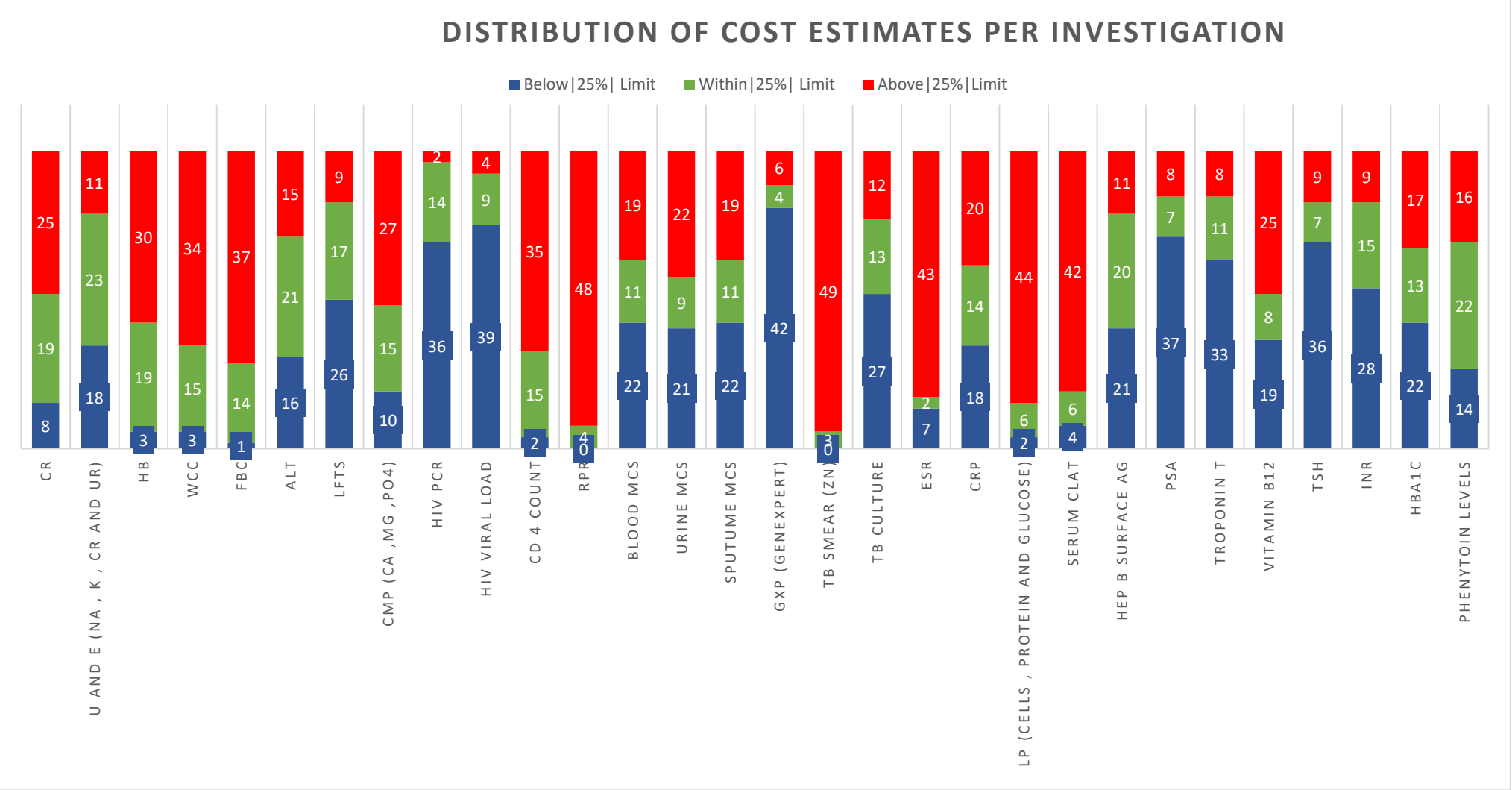

Figure 1: Distribution of Cost Estimates per Investigation

5 Discussion

Limited research evaluating cost awareness amongst doctors in South Africa was found.(16) In a country with limited resources and significant health care expenditure this should be addressed.(3,4,8,9,16) Greater insight into the cost awareness of laboratory investigations amongst doctors will facilitate the transition to a more cost effective health care service.(13,16,19,21)

An accurate estimation of cost occurred in only 23.53% (95% CI 21.09 – 25.97) of thirty commonly requested laboratory investigations. A systematic review analysing cost awareness of diagnostic and non-drug therapeutic cost found that doctors were able to accurately estimate cost in a third of instances.(19) The authors advised that the education of doctors and access to cost information needed to be improved.(19) This level of cost awareness was not achieved in this study and should be of concern, as laboratory expenditure constitutes a large portion of the district health care budget.

This study found no statistically significant difference in cost awareness was among doctors due to demographic factors: Age, gender, position held, district of practice or years of practice. Doctors had a mean age of thirty-two years and the majority had less than five years of experience. Improving cost awareness at a district level has the potential for significant long-term cost savings, as the majority of doctors working there are only starting their careers.

Doctors' university of study was not evaluated. The validity of this data would be questionable as doctors would have had further training during their internship which would confound results. To accurately evaluate the cost awareness training at the various health science faculties an assessment would have to be done at graduation.

Doctors tended to overestimate cost, however, this was not statistically significant. Overestimation of cost has been found to be a common occurrence in cost awareness studies.(17,20) These studies evaluated health care commodities with a large variance in cost. Doctors had to estimate the cost of very low-cost items.(17) In these low-cost items, a 25% absolute deviation from actual cost is a very small amount.(17) Laboratory investigation are not low-cost items and thus could account for why this was not a significant finding.

No significant difference in cost awareness was found between the West Coast and Cape Winelands districts. Access to two of the facilities within the Cape Winelands district was not granted but as no difference was established this is unlikely to have influenced results. The effect of geographical location and availability of senior supervision would have been interesting demographic characteristics to have evaluated. However, recent research from Chris Hani Baragwanath Academic Hospital in urban Gauteng had similar findings so no significant effect is expected.(17)

Doctors acknowledged their lack of cost awareness and lack of prior training in this regard. Doctors acknowledge that cost influenced their decisions when ordering laboratory investigations and that increasing cost awareness would change their ordering of laboratory investigations. The new NHLS primary health care laboratory request form does not display cost even though their stated aim is to

improve cost effectiveness.(22) Evidence suggests that revising this laboratory request form to include cost should be considered.(13,18)

The district health care system in South Africa relies heavily on junior doctors. This was evident within this study as more than half of respondents had less than five years of experience. These doctors provide initial after hours care and are responsible for admission, referral and transfer of patients to higher levels of care. With limited cost awareness and clinical experience a significant number of avoidable investigations are bound to occur.(13)

Electronic gate keeping (eGK) has been introduced to prevent overutilization of laboratory investigations.(7,11) A single intervention to improve the cost effectiveness of clinical practice is not advised.(13) This eGK system does not control commonly requested “lower cost” laboratory investigations, like a serum creatinine level, as these investigations are not gate kept. The inappropriate requests of such investigations can amount to a significant sum nationally and should not be overlooked. eGK fails to address all the structures and processes that effect why doctors are ordering laboratory investigations inappropriately and further research into this would provide valuable insight. Empowering doctors to become more cost effective is one of the steps that needs to be taken to address this issue.

Information about cost need to become more freely available to doctors, cost conscious clinical governance measures via continuous professional development (CPD) activities and analysis of current eGK trends within facilities with timeous feedback needs to occur. Doctors should be encouraged to identify structural and process criteria which are causing avoidable laboratory requests and unnecessary expenditure. Quality improvement cycles to address this need to occur. A culture of quality improvement need to be promoted and should receive greater recognised during staff performance management system (SPMS) assessments.

As cost effectiveness is multifactorial, consulting with practicing doctors on the practicality of any intervention is the only way to find a viable solution. To ensure success in this regard, a more comprehensive approach needs to be taken.(13)

6 Limitations

This was small scale multi-centre study that was set in peri urban and rural facilities where limited specialist supervision is available. There was a small total number of respondents. Data collection occurred over multiple days and was arranged with the clinical or medical manager at each facility which could have allowed for the potential forewarning of respondents to the nature of the study.

7 Conclusion

Cost awareness among doctors regarding laboratory investigations was poor regardless of demographic factors. Doctors acknowledged their lack of cost awareness and reported limited access to information about cost, that minimal training has been received and agreed that increasing their knowledge of cost would change their decision making.

Cost awareness is one of the factors that influence the cost effectiveness of doctors and further research into its effect in the South African setting should be undertaken.

8 Recommendations

Interventions to improve the cost-effective use of laboratory investigations via existing structures should be evaluated.

Improving education on cost, comprehensive guidelines and protocols across all specialities and revision of the current NHLS laboratory ordering process with real time feedback on cost and gate keeping are all recommendations that need to be made.(18)

9 Acknowledgements

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